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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/483,712

Filing Date: January 14, 2000

Appellant(s): JIANG ET AL.

J. Jeffrey Gunn

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed Marcy 7, 2007 appealing from the Final Office action mailed September 6, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,677,566	King et al.	10-1997
2001/0011773 A1	Havens et al.	8-2001
5,894,107	Lee et al.	4-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5-9, and 13-16, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over King et al. (US 5,677,566) in view of Havens et al. (US Pub 2001/0011773 A1).

In re claims 1 and 2, King et al. shows (figs. 6-8) an intermediate structure in the fabrication of a chip scale package comprising: a semiconductor die (14) having an active surface having a plurality of bond pads (18) thereon; a dielectric element (16) having an upper surface and a lower surface, the lower surface of the dielectric element attached to a portion of the active surface of said-the semiconductor die; a plurality of conductive lead frame members (13) having inner ends laterally spaced from said the plurality of bond pads, each conductive lead frame member of the plurality of conductive lead frame members having an upper surface (12) and a lower surface, a portion of the lower surface of each conductive lead frame member of the plurality of conductive lead frame members being attached to a portion of the upper surface of the dielectric element (16) for connecting each conductive lead frame member of the plurality of conductive lead frame members to the active surface of the semiconductor die; a plurality of discrete conductive bond members (22), at least one discrete conductive bond member of the plurality of conductive bond members connecting the inner end of each conductive lead frame member of said-the plurality of conductive lead frame members to at least one bond pad of the plurality of bond pads on the active surface of the semiconductor die; a plurality of conductive carrier bonds (28), at least one carrier bond of the plurality of conductive carrier bonds directly disposed on the upper surface of each conductive lead frame member of the plurality of conductive lead frame

members at a location remote from the inner end thereof and extending transversely from the upper surface thereof. King shows all of the elements of the claims except the intermediate structure free of encapsulant material to be subsequently applied to the intermediate structure. Havens et al. discloses [0025-0028] a package process in which an intermediate structure in the fabrication of a chip scale structure comprises the intermediate structure being free of encapsulant. The circuit substrate, ILD layers, conductive layers, and external conductors (solder balls 6) are formed prior to the encapsulation process. The encapsulant material is formed last to reduce moisture and improve product yield. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the intermediate package structure of King by forming the intermediate structure free of encapsulant as taught by Havens to reduce the amount of moisture in the package during the subsequent encapsulation process and ultimately improving the device yield.

In re claim 5, King et al. shows (fig. 3) wherein the upper surface and lower surface of the dielectric element are attached respectively to a portion of the lower surface of each conductive lead frame member of the plurality of conductive lead frame members and a portion of the active surface of the semiconductor die connecting portions of said the plurality of conductive lead frame members and to portions of the active surface of the semiconductor die.

In re claims 6-9, and 13-16, and 19 King discloses (col. 3, lines 10-21) wherein the plurality of conductive lead frame members comprises a plurality of lead fingers. The plurality of conductive lead frame members comprises a conductive metal. The plurality

of discrete conductive bond members comprises a conductive metal. The plurality of discrete conductive bond members comprises bond wires. The plurality of conductive carrier bonds includes metal. King also shows (fig. 4) that the plurality of conductive carrier bonds is selectively located on the upper surfaces of the plurality of conductive lead frame members forming an array over the active surface of the semiconductor die and that the plurality of conductive carrier bonds comprises solder balls.

In re claim 19, King shows (fig. 3) that each conductive carrier bond of the plurality of conductive carrier bonds further comprises an upper portion and a lower portion, the lower portion of a-each conductive carrier bond being attached to the upper surface of an associated conductive lead frame member of the plurality of conductive lead frame members. The encapsulating material is disposed only about the lower portions of the plurality of conductive carrier bonds.

Claims 3, 4, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over King et al. (US 5,677,566) in view of Havens et al. (US Pub 2001/0011773 A1) as applied to claims 2 and 9 above and further in view of Lee et al. (US 5,894,107).

In re claims 3, 4, and 10-12, King does not specifically disclose the materials of the dielectric element, the materials of the bond wires, or the types of conductive bond members, but such elements are not patentably distinguishable over the cited art because such materials are well known in the art. However, Lee et al. discloses a (col.

Art Unit: 2815

4, line 60 – col. 5, line 20) a chip scale package in which a dielectric element may be any adhesive including polyamide tape or films. The conductive bond members may comprise any conventional connecting members including metal, wires, gold, TAB or thermocompression bonds. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the materials of King and Havens by using specific materials of polyimide for the dielectric element, gold wires, and TAB or thermocompression bonds for the discrete conductive bond members as taught by Lee to provide well known, suitable conductor connections to form the chip scale package.

(10) Response to Argument**(A) The First Rejection****(i) Claims 1, 2, 5-9, 13, 15, 16, and 19**

The appellant primarily asserts that there is insufficient motivation to combine King et al with Havens et al. as proposed by the examiner. The examiner believes that proper motivation has been shown and that the combined references show all of the elements of the claims. As stated in the final rejection and as agreed upon in the appellant's arguments (pgs. 5-6), King does not teach an intermediate structure in which the carrier bond is attached to the upper surface of the lead frame member of the intermediate structure, wherein the intermediate structure is free of encapsulant material. Havens was cited to cure the deficiencies of King by showing an intermediate structure having a carrier bond attached to the lead frame while the structure is free of

encapsulant. As stated in the final rejection, Havens discloses [0025-0028] that an encapsulant (hydrophobic hermetic covering) may be formed after applying the carrier bonds (solder balls 6) to the structure. Havens clearly states in [0025] that:

This invention largely solves the moisture sensitivity problems associated with electronic packages (e.g. chip carriers) by covering substantially all of the external surfaces of the electronic package, with the exception of a portion of the conductors that are required for electrically coupling to an external substrate, with an essentially hermetic covering which is highly hydrophobic. ...The protective covering then seals all the surfaces to which it is exposed, forming a barrier which greatly retards future moisture absorption. The reduced level of moisture improves product yields and reliability thru the final assembly and testing processes.

One of ordinary skill in the art would look to improve King by forming the carrier bonds (balls 28) before forming the encapsulant, thereby forming an intermediate structure having no encapsulant formed thereon. In this way, moisture in the package is reduced, the reliability of the package is increased, and the product yield is improved.

The appellant attacks this motivation in the arguments at the end of page 6 through all of page 7 of the Appeal Brief by stating that Havens teaches that the carrier bonds may also be attached after applying the hermetic covering to the package. For this reason, the appellant argues that Havens does not teach the desirability of attaching the carrier bonds before applying the encapsulant as opposed to attaching the

carrier bonds after applying the encapsulant. According to the appellant, since Havens does not teach such a desirability, and King already teaches applying the encapsulant prior to forming the carrier bonds, then one of ordinary skill would only be motivated to form the encapsulant prior to forming the carrier bonds. The appellant's logic on this issue is faulty simply for the reason that Havens does not teach the desirability of forming the solder balls after forming the encapsulant. As stated in the appellant's arguments (last full paragraph of page 6) Havens discloses in paragraph [0057] that the carrier bonds may alternatively be formed after applying the encapsulant. However, this disclosure does not mention any reasons why one would perform this process at all. Havens therefore only discloses the desirability of forming the carrier bonds prior to forming the encapsulant [0025]. The recitations of Havens [0057] pertaining to the carrier bonds being formed after the encapsulant, as recited in King, are merely descriptions of alternative old configurations which are obviously well known in the art.

Even if one were to conclude, as the appellant has concluded, that Havens teaches that the encapsulant improves the reliability and product yield regardless of when the carrier bonds are attached (see appellants' arguments at the end of pg. 8 of the Appeal Brief), Havens additionally teaches that all of the carrier bonds/conductors are covered by the encapsulant to facilitate shipment or portions of the carrier bonds/conductors are exposed to facilitate subsequent processing (see Havens [0026]). The appellant further argues on page 9 of the Appeal Brief that there is no description of how covering the package completely facilitates shipment (and thus implies that there is no motivation). However, Havens states [0026] that:

"...all of the package, all of the external conductor surfaces, are covered (e.g., to facilitate shipment). In another embodiment, portions of the external conductor surfaces are exposed thus enabling immediate subsequent processing (e.g., solder reflow).

From that paragraph, one of ordinary skill would understand that the package could be completely covered and shipped immediately after the encapsulation process (facilitating shipping) or the package could be partially covered to allow subsequent processing after the encapsulation process (thus steps are performed such as solder reflow prior to completing the package and shipping it). If King were to read from Havens, King would realize that it is easier and quicker to form the carrier bonds/solder balls first, then encapsulate the package, and ship it to the customer. Whereas, if King encapsulated the package before forming the carrier bonds, subsequent processes would have to be performed such as drilling or etching holes into the hardened encapsulant, and then attaching the carrier bonds to the leads of the structure through the encapsulant, thus adding process steps and ultimately NOT facilitating shipment of the completed package. It's a very simple concept and an additional motivation for forming the carrier bonds on the intermediate structure prior to encapsulation. The point is that Havens, once again, teaches that the carrier bonds are formed prior to the encapsulation process, that the intermediate structure is free of subsequent encapsulant, and that it is desirable to form the package in such a manner.

The appellant further summarizes on page 10 of the Appeal Brief that there is no distinguishing motivation taught in Havens for forming the intermediate structure having the carrier bonds and being free of subsequently applied encapsulant as opposed to forming the structure having the encapsulant prior to forming the carrier bonds. Even, if one were to agree, there is no argument that motivation is not present in the teachings of Havens. Thus at the very least, Havens satisfies the requirements for establishing a prima facie case of obviousness because some form of motivation is suggested or taught.

In response to the appellant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

For the same reasons that the rejection of independent claims 1 and 2 should be maintained, the rejection of claims 5-9, 13, 15, 16, and 19 should also be maintained.

(ii) Claim 14

The appellant further argues that the rejection of dependent claim 14 is also improper because neither King nor Havens teaches a plurality of conductive carrier

bonds comprising a conductive or conductor-filled polymer. The appellant then goes on to state that King only teaches that carrier bonds may comprise solder balls. However, King additionally states (col. 4, lines 60-65) that the carrier bonds (external electrodes/solder balls 38) may be formed by processes other than those used for forming solder balls (which would include forming a conductive or conductor-filled polymer). Therefore, the rejection of claim 14 is still proper and should be maintained.

(B) The Second Rejection

(i) Claims 3, 4, and 10-12

For the same reasons that the rejection of independent claims 1 and 2 should be maintained, the rejection of claims 3, 4, and 10-12 should also be maintained. The appellant has not provided any other additional reasons as to why motivation is lacking in the references. The examiner has shown that explicitly that motivation is present in the references, that the combined references show all of the elements of the claims, and that the rejection should be maintained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

MEW

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